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09/936,818	02/28/2002	Koji Takahashi	829-585	1578

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 04/30/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

A-S

**Office Action Summary**

Application No.

09/936,818

Applicant(s)

TAKAHASHI ET AL.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 29-144 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 29-144 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
 Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/8/2003 has been entered.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 29-144 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 29 recites, "supplying aluminum and ammonium (NH<sub>3</sub>) directly onto a surface of the crystal" in line 3. The instant specification does not explicitly teach aluminum and ammonium are directly supplied onto a surface of a crystal. The specification merely teaches supplying aluminum and ammonium to the surface. Likewise for claims 63 and 100.

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4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

5. Claims 29-144 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 29 recites, "supplying aluminum and ammonium ( $\text{NH}_3$ ) directly onto a surface of the crystal" in line 3. The difference between directly supplying and indirectly supplying is unclear. It is typical for gaseous reactants to be supplied directly to a growth substrate in vapor growth process. Where else would the reactants be supplied other than directly to the surface of the substrate?

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 29-32, 34-36, 45-48, 61-66, 68-70, 82-85, 90, 98-103, 105-107, 119-122, 132, and 140-141 are rejected under 35 U.S.C. 102(b) as being anticipated by Adomi et al (US 5,442,201).

Adomi et al discloses growing an epitaxial layer of a compound semiconductor alloy doped with nitrogen and represented by the formula  $(\text{Al}_x\text{Ga}_{1-x})_y\text{In}_{1-y}\text{P}$  ( $0 < x \leq 1$ ,  $0 < y \leq 1$ ). Adomi et al also teaches using  $\text{NH}_3$  as a nitrogen doping source and the presence of organic aluminum is considered to contribute to efficient nitrogen doping, allowing a higher amount of nitrogen doped

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(col 2, ln 1-65). Adomi et al also teaches a light emitting device is fabricated by growing an n-type AlGaP layer 4, an N-doped AlGaP layer 3, an N-doped AlGaP layer 2 and a p-type AlGaP on a GaP substrate 5 (col 2, ln 66 to col 3, ln 5 and Fig 1). Adomi et al also discloses the n-type AlGaP layer 4 is formed by supplying a mixed source gases of TMAI, TMGa and PH<sub>3</sub> at a growth temperature of 850°C. Adomi et al also discloses the larger AlP molar ratio of an alloy AlGaP tends to have higher nitrogen concentration in the AlGaP when the NH<sub>3</sub> concentration is the same, resulting in more efficient nitrogen doping and it is extremely hard to dope nitrogen in GaP without the presence of TMAI (col 3, ln 6-67 and Fig 4). Adomi et al also discloses MOVPE is used as the epitaxial growth method and other methods such as CBE (chemical beam epitaxy) can be used (col 4, ln 1-67). Adomi et al also teaches nitrogen is doped to GaP layers near a p-n junction to substitute P sites in order to improve the light emitting efficiency (col 1, ln 20-35).

Referring to claim 29, Adomi et al is silent to supplying aluminum and ammonium directly onto a surface of the crystal. Adomi et al teaches the chemical beam epitaxial method may be used (col 4, ln 40-46). Chemical beam epitaxy inherently supplies reactants directly to the substrate, as evidenced by Tomomura (WO 98/44539) below, which teaches irradiating a substrate with molecular beams of source material in a growth chamber, as in a chemical beam epitaxy (col 1, ln 10-25).

Referring to claim 29-30, Adomi et al discloses Al increases the efficiency of nitrogen doping and organic aluminum, i.e. vapor phase, is considered to contribute to efficient nitrogen doping (col 2, ln 25-35), this reads on applicant's decomposition of ammonium and adsorption of nitrogen is accelerated. Furthermore, Adomi et al discloses supplying ammonia and Aluminum

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directly onto a substrate surface as applicant, therefore the addition or crystallization of the nitrogen from the ammonia which is supplied directly onto the surface of the crystal into the surface of the crystal is accelerated by the aluminum supplied to the surface of the crystal is inherent because Adomi teaches a similar process of supplying aluminum and ammonia to form a nitrogen in a crystal.

Referring to claim 31, Adomi et al discloses an AlGaP layer doped with nitrogen, where the Al inherently exists throughout the layer, including the surface.

Referring to claim 32, Adomi et al discloses in Fig 4 that a larger molar ratio of AlP of an AlGaP alloy tends to have higher nitrogen concentration, this reads on applicant's an amount of nitrogen added to a crystal, a nitrogen composition, an amount of nitrogen adsorbed and amount of an element in the crystal surface is controlled by the Al. Also these would be inherent to Adomi et al.

Referring to claim 34, Adomi et al discloses CBE and MOVPE (col 4, ln 35-50). Adomi et al does not disclose MBE or GS-MBE. Chemical beam epitaxy (CBE) inherently is a form of MBE because CBE irradiates a substrate with molecular beams, as evidenced by Tomomura (WO 98/44539) below, which teaches GSMBE, CBE and MOMBE are generically referred to as MBE ('822 col 1, ln 10-50).

Referring to claim 35, Adomi et al discloses AlGaP:N (Fig 1) and P reads on applicant's Group V element other than nitrogen.

Referring to claim 36, Adomi et al discloses Phosphorous. Adomi et al does not disclose Arsenic or antimony. Arsenic, antimony and phosphorous are well-known Group V elements, used in the manufacture of Group III-V compound semiconductors. It would have been obvious

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to a person of ordinary skill in the art at the time of the invention to modify Adomi et al by using Arsenic or antimony, which are well-known equivalents to phosphorous for the manufacturing of III-V compound semiconductors. Substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Referring to claims 45-46, Adomi et al discloses a GaP substrate (Fig1). Adomi et al does not disclose a substrate of GaAs, InP, GaSb or Si, which are well-known substrates used in the formation of Group III-V compound semiconductors. It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Adomi et al by using a GaAs, InP, GaSb or Si substrate because substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

Referring to claim 47-48, Adomi et al teaches a nitrogen doped epitaxial layer is an active layer and a light emitting device (col 1, ln 50-68 and Fig 1)

Referring to claim 63 and 100, Adomi et al teaches growing an AlGaInPN crystal, supplying  $\text{NH}_3$  to a surface and the larger AlP molar ratio of an alloy of AlGaP tends to have a higher nitrogen concentration, this reads on applicant's adsorption of the nitrogen atom generated by decomposition of the ammonium supplied to the surface of the crystal is accelerated by the aluminum included in the surface of the crystal. Furthermore, Adomi et al discloses supplying ammonia to a substrate surface containing aluminum as applicant, therefore decomposition of the ammonium supplied to the surface of the crystal is accelerated by the aluminum included in the surface of the crystal is inherent because Adomi teaches a similar process of supplying ammonia to the surface of an aluminum containing crystal to form nitrogen in a crystal.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 34, 37-39, 42-44, 49-50, 53-60, 68, 71-76, 79-81, 86-87, 92-97, 105, 108-109, 112-113, 116-118, 123-126 and 133-139 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adomi et al (US 5,442,201) as applied to claims 29-32, 34-36, 45-48, 61-66, 68-70, 82-85, 90, 98-103, 105-107, 119-122, 132, and 140-141 above, and further in view of Tomomura (WO 98/44539), where US 6,358,822 is used as an accurate translation and a translation of WO 98/44539 can be provided upon request.



Adomi et al teaches all of the limitations of claim 37, as discussed previously, except a substrate temperature of 450-640°C.

In a method of growing a Group III-V compound semiconductor, note entire reference, Tomomura teaches a Group III-V compound semiconductor layer including nitrogen and at least another Group V element grown by molecular beam epitaxy and is grown by irradiating a substrate with material molecular beams in crystal growth chamber so evacuated that the mean free path of material molecules is larger than the distance between the substrate and molecular beam sources, a nitrogen compound is used as a nitrogen source and molecules of the nitrogen compound decompose after they reach the substrate surface and only nitrogen atoms are incorporation into the growing semiconductor crystal (abstract). Tomomura also teaches a nitrogen hydride,  $\text{NH}_3$ , is used as the nitrogen compound and the substrate temperature is maintained at 500-750°C during crystal growth ('822 col 3, ln 1-50). Tomomura also teaches the substrate is a compound semiconductor which as a zinc blend structure and the substrate surface has an off-angle of 5-15° from {100} plane to a {111}A plane and decomposition is promoted and high incorporation efficiency of nitrogen is achieved on this substrate surface ('822 col 3, ln 50 to col 4, ln 5). Tomomura also teaches Al, Ga and In molecular beams were directed to a substrate by heating a solid metallic material using a Knudsen cell ('822 col 5, ln 10-55). Tomomura also teaches incorporation efficiency of nitrogen into the crystal can be improved ('822 col 4, ln 5-35). Tomomura also teaches GSMBE, CBE and MOMBE ('822 col 15, ln 1-30 and col 1, ln 5-55). Tomomura also teaches a timing chart for supplying reactant gases in sequence and one cycle of the source supply sequence is set in a range of 0.5 to 5 molecular layers to form a mixed crystal with uniform composition ('822 Fig 6 and col 10, ln 25-67).

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It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Adomi et al with Tomomura method of forming Group III-V compound semiconductor at a temperature of 500-750°C using MBE to improve incorporation efficiency of nitrogen into a crystal and lower operating temperatures reduces operating costs.

Referring to claim 34, Tomomura teaches MBE, GSMBE, CBE and MOMBE ('822 col 1, ln 10-25).

Referring to claim 37, Tomomura teaches a temperature of 500-750°C. Overlapping ranges are held to be obvious (MPEP 2144.05).

Referring to claim 38-39, 74-76, and 112-113, Tomomura teaches the substrate surface has an off-angle of 5-15° from {100} plane to a {111}A plane, this reads on applicant's surface slanted from a (100) surface in a [011] direction or a crystal face which is equivalent.

Referring to claim 42, Tomomura teaches an evacuated chamber and a mean free path of a molecule of each source material is longer than a distance between the substrate and a source material ('822 col 2, ln 50-67).

Referring to claim 43, Tomomura teaches solid sources in Knudsen cells.

Referring to claim 44, Tomomura teaches a nitrogen compound decomposed at the growth surface ('822 col 3, ln 1-10)

Referring to claim 53-54, the combination of Adomi et al and Tomomura teach III-V compound semiconductor active layer used in a laser for optical fiber communication, this reads on a system ('822, col 1, 25-40).

Referring to claim 73, Tomomura teaches the nitrogen material and the material of the group V elements are not supplied at the same time in Fig 6.

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10. Claims 40-41, 51-52, 77-78, 88-89, 91 and 114-115 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adomi et al (US 5,442,201) as applied to claims 29-32, 34-36, 45-48, 61-66, 68-70, 82-85, 90, 98-103, 105-107, 119-122, 132, and 140-141 above, and further in view of Ito (Empirical interatomic potentials for nitride compounds semiconductors).

Adomi et al teaches all of the limitations of claim 40, as discussed previously, the semiconductor layer A including at least aluminum and nitrogen in its composition but not including indium in its composition and the semiconductor layer B including at least indium in its composition but not including nitrogen in its composition.

Ito teaches versatility of empirical potentials with AlN for various monolayer superlattices with InP or InAs (Abstract). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Adomi et al with Ito superlattice of AlN and InP or InAs monolayers because superlattices reduce lattice mismatch strain between layers.

11. Claims 33, 67, 104, 110-111 and 127-131 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adomi et al (US 5,442,201) as applied to claims 29-32, 34-36, 45-48, 61-66, 68-70, 82-85, 90, 98-103, 105-107, 119-122, 132, and 140-141 above, and further in view of Motoda et al (US 5,872,022) and Ouchi (JP 10-152399), where US 6,046,096 is used as an accurate translation and a translation of JP 10-152399 can be provided upon request.

Adomi et al teaches all of the limitations of claim 110, as discussed previously, except etching the layered structure while masking a portion of the layered structure such that the first

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semiconductor layer is exposed in a portion of an etch surface and supplying ammonium to the etched surface.

In a method of forming a compound semiconductor structure, note entire reference, Ouchi teaches a portion of a compound semiconductor is irradiated with material including at least nitrogen and a group V element of the irradiated portion is substituted with nitrogen (abstract). Ouchi also teaches a GaAs substrate **501**, a grating **502** formed on the substrate and performing a nitrification process around a recess portion to form a large number of InGaAsN quantum wires **505** along the recess portion at a substrate temperature of 800°C ('096 col 10, ln 35 to col 11, ln 5 and col 7, ln 20-35 and Fig 5). Ouchi also teaches when substitution by nitrogen is selectively conducted and a semiconductor layer containing nitrogen and layer without nitrogen are formed in a distributed pattern, a fine structure, such as a quantum wire can be readily fabricated ('096 col 11, ln 10 to col 12, ln 25). Ouchi also teaches improved characteristics, such as low threshold, is achieved by a device with a quantum wire structure ('096 col 6, ln 1-50). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Adomi with Ouchi's selective nitrification to form a quantum wire structure to improve the characteristics of the device.

In a method of forming a semiconductor device, note entire reference, Motoda et al teaches a diffraction grating process, where an insulating film is formed on a diffraction grating layer **25**, a stripe-shaped diffraction grating pattern **32** is formed and used as a mask. Motoda et al also teaches the diffraction grating layer is etched, thereby forming a groove having a (111) facet surface and producing a diffraction grating (col 16, ln 30 to col 17, ln 45 and Figs 14(a)-14(f)). It would have been obvious to a person of ordinary skill in the art at the time of the

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invention to modify the combination of Adomi et al and Ouchi with Motoda et al's method of forming a grating by etching because deposition and etching to form the grating can be performed in the same apparatus to avoid oxidation of the oxidation and contamination, which is detrimental to the device (col 2, ln 1-35).

Referring to claim 33, the combination of Adomi et al, Ouchi and Motoda et al teach forming a diffraction grating pattern, where nitrification occurs in a recessed portion, this reads on applicant's restricted region.

Referring to claim 110, the combination of Adomi et al, Ouchi and Motoda et al teach forming a grating pattern by etching and supplying ammonium to a substrate to substitute a constituent element in the first semiconductor layer in a layered structure.

Referring to claim 111, Motoda et al teaches a (111) surface.

Referring to claim 127, the combination of Adomi et al, Ouchi and Motoda et al teach a diffraction grating and a periodic wire structure at a  $\frac{1}{2}$  of the pitch of the grating ('096 Fig 5) and substitution of nitrogen.

Referring to claim 128, the combination of Adomi et al, Ouchi and Motoda et al teaches a quantum wire.

Referring to claim 129, the combination of Adomi et al, Ouchi and Motoda et al teaches ammonium.

### ***Response to Arguments***

12. Applicant's arguments with respect to claims 29-144 have been considered but are moot in view of the new ground(s) of rejection.

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13. Applicant's arguments filed 12/8/2003 have been fully considered but they are not persuasive.

Applicants' argument that Adomi does not teach supplying aluminum and ammonium directly onto the surface of the crystal is noted but is not found persuasive. Adomi teaches a metal-organic vapor phase epitaxy or chemical beam epitaxy may be used (col 4, ln 40-46). Chemical beam epitaxy (CBE) is well known in the art to be a form of molecular beam epitaxy, which involves irradiating a substrate with molecular beams of source materials in a growth chamber ('822 col 1, ln 10-50), as evidenced by Tomomura (WO 98/44539), where US 6,358,822 is used as an accurate translation. The chemical beam epitaxy process taught by Adomi reads on applicants' directly supplying aluminum and ammonium to the surface of the crystal.

Applicants' also allege that an adduct (TMAI:ammonium) is formed between the ammonium and TMAI, which is an intermediate product formed without employing the surface of the substrate. This is not found persuasive because Adomi merely teaches, "we believe an adduct is formed between  $\text{NH}_3$  and TMAI and the chemical bonding between the Al and N plays an important role when N is doped in AlGaP, note column 3, lines 61-65. Adomi merely believes an adduct is formed; he does not teach an adduct is actually formed. Also, Adomi teaches CBE which is well known in the art to a method of irradiating a substrate with molecular beams of source materials, note Tomomura (US 6,358,822) column 1, lines 10-25. Furthermore, the adduct (TMAI:ammonium) is supplied directly to the substrate, which meets the limitation of directly

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supplying ammonium and aluminum because the claim is not limited to compounds of aluminum and ammonium directly supplied to the surface of the substrate.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., an intermediate product is not formed (pg 28)) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicants' argument that Adomi does not teach MBE is noted but is not found persuasive. Adomi teach chemical beam epitaxy, which is a form of molecular beam epitaxy, as evidenced by Tomomura (US 6,358,822), note column 1, lines 43-50, which teaches CBE and GS-MBE are generically referred to as the MBE method and CBE employs molecular beams, as molecular beam epitaxy ('822 col 1, ln 10-25).

Applicants' argument that the claimed temperature range produces unexpected results is noted but is not found persuasive. Temperature is well known in the art to be a result effective variable and there is no showing that the results obtain by applicants would be unexpected to a person of ordinary skill in the art. It is also noted that the claimed temperature range is conventional for a substrate when a nitrogen hydride is used a nitrogen compound, as evidenced by Tomomura (US 6,358,822), note column 3, lines 33-37.

Applicants' argument that a person of ordinary skill in the art would not have used the MBE temperature (580°C) of Tomomura in the MOVPE system of Adomi because the deposition techniques are unrelated is noted but is not found persuasive. The Examiner agrees that the temperature of Tomomura would not be applicable to an entirely different type of

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deposition, such as an MOVPE. However, the rejection is based on the fact that it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Adomi with Tomomura's MBE technique, which uses a substrate temperature of 500-750°C because Adomi teaches other methods such as CBE can be used. Tomomura teaches the term MBE encompasses CBE (column 1, lines 40-55). Substitution of known equivalents for the same purpose is held to be obvious (MPEP 2144.06).

### ***Conclusion***

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 571-272-1468. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew J Song  
Examiner  
Art Unit 1765

MJS

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**

